



TEXAS A&M UNIVERSITY
REMOTE SENSING CENTER

COLLEGE STATION TEXAS 77843

College of Agriculture
College of Engineering
College of Geosciences
College of Science

TYPE I PROGRESS REPORT-NUMBER 4

Period: May 28, 1973 to July 27, 1973

TITLE: MONITORING THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION (MMC 667) (Contract No. NAS5-21857)

PRINCIPAL INVESTIGATOR: Dr. J. W. Rouse, Jr. (UN220)
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PROJECT DESCRIPTION:

This regional study monitors the vernal advancement and retrogradation of natural vegetation (green wave effect) using ERTS observations throughout the Great Plains Corridor. The green wave effect is charted by using the relatively homogeneous rangeland vegetation systems of the Mixed Prairie region in the central United States as phenological indicators. ERTS multispectral scanner data and ground observations collected from the network of ten test sites are used to measure vegetation changes during the life-time of ERTS-1. Attention is given to observing seasonal drought and other bioclimatic influences which impact upon management and production in agriculture. The overall objective of this investigation is to determine the effectiveness of ERTS-type data in monitoring the vegetation conditions of direct concern to rangeland management and agri-business decisions in this region.

(E73-10891) MONITORING THE VERNAL
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EFFECT) OF NATURAL VEGETATION Progress
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ACCOMPLISHMENTS:

During the period covered by this report the following tasks were accomplished:

- a) Computer programs previously developed to accumulatively assimilate vegetation data obtained from ground sampling at the ten network test sites were employed to summarize the vernal phase data.
- b) All data logs including those for ERTS-1 data and aerial photography have been updated.
- c) Intensive field sampling initiated in April at the Throckmorton test site was continued in May and July of 1973. Intensive sampling involves the collection of vegetation cover, biomass, and chlorophyll content measurements of grasses and forbs by range site and within specific grazing treatments. The sample data will be utilized to record in detail a wide variety of vegetation parameters to document existing vegetation conditions at the intensive sampling sites.
- d) Three stages of large-scale color IR aerial photography were taken at Throckmorton and

College Station by the Texas Forest Service. These photographs were made in conjunction with the data collection periods in May and July.

- e) Computer analyses of MSS digital data were continued during this reporting period for 32 km X 32 km grey-scale maps of at least one date for all ten test sites. Acetate overlays showing prominent features at each of the test sites have been made and are routinely used for locating 6.4 km X 6.4 km areas centered on the test site. Site processing reports for all bands of MSS digital data were produced for the 6.4 km X 6.4 km areas at each of the test sites.
- f) The utility of band-to-band ratios for detection of temporal changes as a measure of rangeland vegetation is being investigated. The study involves evaluating band-to-band ratios for 33 clear days during the autumnal and early vernal phases at five southern Great Plains Corridor test sites. Specific band-to-band ratios are being evaluated relative to vegetation and weather parameters.

- g) Image descriptors were assigned for all ERTS-1 imagery containing good quality Great Plains Corridor network test site data (Appendix).

SUMMARY OF SIGNIFICANT FINDINGS:

A comprehensive review of ERTS-1 MSS color composite imagery, obtained during the autumnal and vernal phases over the Great Plains Corridor test sites, shows that temporal changes in rangeland vegetation can be manually interpreted. The degree to which manual interpretations can be made from the MSS color composites appears to be limited primarily by variations in image reproduction quality. The vernal advancement and other phenophase related phenomena are observable from cycle to cycle and within a single frame for rangeland vegetation. Vegetation changes due to environmental conditions among the test sites and among grazing treatments within test sites are readily observable.

An investigation has been initiated which will evaluate band-to-band ratios as an index of rangeland vegetation condition. Data currently available from August 1972 through April 1973 for the five southern test sites are being used to characterize band-to-band

ratios as a function of quantity and quality of rangeland vegetation at each of the test sites.

DATA PRODUCT SUMMARY:

The ERTS-1 imagery and tape receipts and orders "quick-look" chart on the following page shows the status of ERTS-1 data inventory and the data requests the end of this reporting period.

Three retrospective data requests were placed during the period covered by this report. These requests were sent on May 28, July 9, and July 16.

Receipt of ERTS-1 MSS standing order black-and-white products continues at a steady pace; however, the lag time for receipt of standing order data has increased to about 6 weeks. MSS color composite products are being received more regularly, but the data quality of the positive prints is variable. The lag in receiving retrospective data orders for MSS data, including color composites and digital data, continues to hamper early investigation of temporal changes through computer analyses or manual interpretation.

SCHEDULED ACTIVITIES:

The following activities are scheduled for the

ERTS-1 IMAGERY AND TAPE

RECEIPTS AND ORDERS

GREAT PLAINS CORRIDOR TEST SITES

| CYCLE | DATES | COLLEGE STATION | SONORA | THROCKMORTON | WOODWARD | HAYS | SAND HILLS | COTTONWOOD | MANDAN | WES-LACO | CHICKASHA |
|-------|---------------|-----------------|--------|--------------|----------|------|------------|------------|--------|----------|-----------|
| 0 | 7/25 - 7/30 | | | | | | | | | | |
| 1 | 8/1 - 8/17 | ◐ | | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 2 | 8/19 - 9/4 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 3 | 9/6 - 9/22 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 4 | 9/24 - 10/10 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 5 | 10/12 - 10/28 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 6 | 10/30 - 11/15 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 7 | 11/17 - 12/3 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 8 | 12/5 - 12/21 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 9 | 12/23 - 1/8 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 10 | 1/10 - 1/26 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 11 | 1/28 - 2/13 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 12 | 2/15 - 3/3 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 13 | 3/5 - 3/21 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 14 | 3/23 - 4/8 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 15 | 4/11 - 4/26 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 16 | 4/29 - 5/14 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 17 | 5/17 - 6/2 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |
| 18 | 6/4 - 6/19 | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |

SYMBOLS:

-  NO DATA PRODUCTS RECEIVED
-  9" B&W POSITIVE TRANSPARENCIES REC'D (STANDING ORDER)
-  B&W PRODUCTS ORDERED (NOT RECEIVED FROM STANDING ORDER)
-  BULK PROCESSED DIGITAL TAPES ORDERED
-  MAGNETIC TAPES RECEIVED
-  NO FURTHER PRODUCT ORDERS ANTICIPATED
-  BULK COLOR COMPOSITE PRINT ORDERED  RECEIVED
-  BULK COLOR COMP. TR. ORDERED  RECEIVED
-  PRECISION COLOR COMP. ORDERED  RECEIVED
-  PRECISION COLOR COMP. TR. ORDERED  RECEIVED

next reporting period:

- a) ERTS-1 MSS data will be received and analyzed as set forth in the Data Analyses Plan for the Great Plains Corridor investigation.
- b) Computerized grey-maps and sun angle corrected mean reflectance data summaries will be produced for 6.4 km X 6.4 km areas which include the Great Plains Corridor test site.
- c) The development of masking procedures for isolating specific areas within the 6.4 km X 6.4 km areas about the test site will be completed. Computer analysis will begin for the intensive test site at College Station and Throckmorton Texas.
- d) Field sampling for intensive investigations at Throckmorton and College Station, Texas will be continued with emphasis given to measuring the factors which influence reflectance temporal changes (i.e. quantity and quality of standing brown and green biomass, chlorophyll content, moisture content, etc.).

- e) Network test site characterization will be continued from existing aerial photography and field validation efforts. These efforts will be aided by the employment of an experienced soil scientist well versed in mapping soils and vegetation.
- f) An investigation comparing band-to-band reflectance ratios for five southern network test sites will be completed. This investigation is expected to show the utility of band-to-band ratios as an index to vegetation conditions.
- g) Routine data handling, imagery evaluation, and assignment of descriptors, product ordering and other routine project activity will continue on schedule.

ERTS IMAGE DESCRIPTOR FORM

(See Instructions on Back)

DATE July 27, 1973PRINCIPAL INVESTIGATOR Dr. John W. Rouse, Jr.GSFC UN220ORGANIZATION Remote Sensing Center

NDPF USE ONLY

D _____

N _____

ID _____

| PRODUCT ID (INCLUDE BAND AND PRODUCT) | FREQUENTLY USED DESCRIPTORS* | | | DESCRIPTORS |
|--|------------------------------|---------|-------|-----------------------------|
| | Range- land | Pasture | River | |
| 130816311M | X | X | X | City, Forest |
| 128916254M | X | X | X | City, Lake |
| 112816311M | X | X | X | Grassland, Forest |
| 123616314M | X | X | X | City, Grassland |
| 114616311M | X | X | X | Lake, Forest |
| 131016424M | X | X | X | Brush |
| 127516484MB | X | X | X | Brush, Grassland |
| 125616430M | X | X | X | Brush |
| 123816430MB | X | X | X | Dormant Vegetation |
| 122116484MB | X | X | X | Lake, Brush |
| 131016415M | X | X | X | Lakes, Grassland |
| 129216420M | X | X | X | Brush |
| 125616421M | X | X | X | Lakes, Cropland |
| 123816421MB | X | X | X | Dormant Vegetation |
| 132916463M | X | X | X | Fallow Field, Irrigation |
| 125716471M | X | X | X | Grassland, Cropland |

*FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE PRODUCT ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

MAIL TO NDPF USER SERVICES
 CODE 563
 BLDG 23 ROOM E413
 NASA GSFC
 GREENBELT, MD. 20771
 301-982-5406

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DATE July 27, 1973

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GSFC UN220

ORGANIZATION Remote Sensing Center

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| NDPF USE ONLY | |
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| N | _____ |
| ID | _____ |

| PRODUCT ID (INCLUDE BAND AND PRODUCT) | FREQUENTLY USED DESCRIPTORS* | | | DESCRIPTORS |
|--|------------------------------|---------|-------|------------------------------|
| | Range- land | Pasture | River | |
| 132916454M | X | X | X | Cropland, Lakes |
| 131216514M | X | X | X | Grassland, Cropland |
| 129416515M | X | X | X | Fallow Field, Grass- land |
| 125716462M | X | X | X | Lakes, Cropland |
| 124016520MB | X | X | X | Haze |
| 131316561M | X | X | X | Dunes |
| 129516562M | X | X | X | Irrigation, Cropland |
| 129617020M | X | X | X | Dunes |
| 120717063M | X | X | X | Snow |
| 129617011M | X | X | X | Grassland, Lakes |
| 129717063M | X | X | X | Lake, Cropland |
| 127917064M | X | X | X | Clouds, Grassland |
| 126017013M | X | X | X | Snow |
| 126117064M | X | X | X | Snow, Ice |
| 130816323M | X | X | X | Brush |
| 125416325M | X | X | X | Cropland, Clouds |

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| PRODUCT ID (INCLUDE BAND AND PRODUCT) | FREQUENTLY USED DESCRIPTORS* | | | DESCRIPTORS |
|--|------------------------------|---|---|-------------------------------|
| | | | | |
| 131016413M | X | X | X | Fallow Fields, Cropland |
| 127416414M | X | X | X | Clouds, Grassland |
| 118416411M | X | X | X | Lakes, Ice |
| 125616415M | X | X | X | Cropland, Grassland |
| 123816415M | X | X | X | Clouds, Dormant Vegetation |

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